

Lunar Reconnaissance Orbiter (LRO) Observations with the Lunar Exploration Neutron Detector (LEND): Neutron Suppression Regions (NSR) and Polar Hydrogen

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Introduction: Orbital detection of neutrons has become the dominant remote sensing technique for detecting and inferring H concentrations and its spatial distribution beneath planetary surfaces [Lawrence et al, (2010) *Icarus*, 205, pp. 195-209, Mitrofanov et al (2007) *Science* 297(5578), 78-81].

Indications for the presence of localized and relatively high water content was provided by LRO and LCROSS. LEND identified *Cabeus*, as the most promising LCROSS impact site [Mitrofanov I. et al. (2010) *Science*, 330, 483], and instruments onboard LRO and LCROSS have measured signatures of water, H₂ and other volatiles in the impact plume [Colaprete A. et al. (2010) *Science*, 339, 463, Gladstone R. et al. (2010) *Science*, 330, 472].

Neutron Suppression Regions (NSRs), as potential locations of polar Hydrogen. Currently available LEND neutron data has identified localized *Neutron Suppression Regions*, or NSRs. The *Cabeus* NSR has a total area of about 700 km² (see Figure 1, *top*). Another well-observed NSR with an area about 1500 km² was detected within the polar crater known as *Shoemaker* (*middle*). The third example (*bottom*) of a well-defined NSR is the northern polar crater *Rozhdestvensky*.

The LEND data do not support a model that suggests PSRs are the sole traps of water molecules from the lunar exosphere. Paige et al. (2010) [*Science*, 330, 479] has shown that a layer of water-rich permafrost may exist below a thin upper-most layer of dry regolith even under conditions of solar irradiation. Also, based on analysis between LOLA and LEND, poleward-facing slopes on the Moon display a predominantly stronger neutron suppression in comparison with equator-facing slopes [McClanahan T. et al. (2011) Abstract #1970 of 42th LPSC].

ly. Surface relief is shown by gray shadows derived from LOLA altimetry.

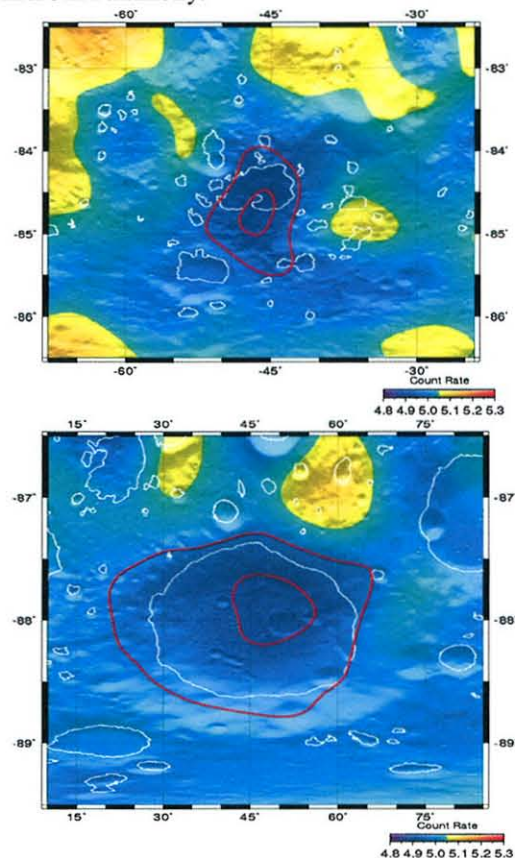


Figure 1: LEND maps of epithermal neutrons for *Cabeus* (*top*), *Shoemaker* (*middle*) and at *Rozhdestvensky* (*bottom*) craters. Shades of blue corresponds to epithermal neutron flux. The boundaries of NSRs and PSRs are shown by red and white contours, respective-

